FADCA BEACON

The FLORIDA AMATEUR DIGITAL COMMUNICATIONS ASSOCIATION Newsletter
Vol. 1, No. 5 Brandon, Fl May 1984

FADCA Nets
3958 Khz. Sundays at 8 AM by K4NTA in Stuart, Fl
147.165 Mhz. Sundays at 7 PM by KF4EF in Brandon, Fl
147.285 Mhz. Sundays at 9 PM by K4AHO in Orlando, Fl
145.010 Mhz. Statewide Packet Radio Frequency

PICNIC PICNIC PICNIC

The first annual FADCA picnic will be held at Highland Hammock State Park on June 10th. The park is located between Avon Park and Sebring off highway 27. We have the rec-hall reserved for the 10th. We will to eat around noon and have lots of packet radio talk all day. Bring everything that you need in the way of food, drink and etc. Talk-in will be on 145.330 -600. There are 50 campsites available for those who want to make a weekend of it. No sewer hookups, but there is a dumpsite in the camping area. Electric and water hookups = $8.40/day; water hookups only = $6.30/day. No pets are allowed in the park. Make you own reservations for a campsite by calling the park at (813)-385-0011. Be sure to tell them that you are with the packet radio group and you will be grouped together, that is if you want to be. They tell us that there is no problem with a small tail gate swap area. There is a charge of 50 cents per person to get in the park. There is also a charge for the use of the rec-hall, so we will pass the hat to cover this. We hope that all of you can come, so we all can meet and have long discussions about common interests. Tell your friends about it too, all are welcome, membership in FADCA is not required.

JACKSONVILLE/ORANGE PARK HAMFEST

The Jacksonville hamfest will be August 4-5 at the Orange Park Dog Track. FADCA has been invited to attend and demonstrate packet radio. We will have a booth in the commerical exhibit area and a spot on the program for a packet radio seminar. Lyle Johnson WA7GXD, President of TAPR has tentatively agreed to come. He will bring several TAPR TNC Kits that will be sold at the FADCA Booth. We really have high hope that Lyle can make it, but if he can't, he will send the kits.

I am looking for volunteers to help man the booth. We will also need to set up at least two working stations in the booth. If you can help out, please get in touch with me.

BYTES FROM THE WRITE ONLY MEMORY TED HUF, K4NTA

1829 N. W. Pinetree Way, Stuart, FL 33494 (305) 692-0728

I received the following letter on April 24th from Bill Whitaker, WD4JKM in Miami: ".... John Rudnick KB4HO and myself presented the Video program at two amateur groups so far this month ..... The repsonse so far has been excellent and packet radio has become a daily topic of discussion on the local repeater."

"Two of the Dade Radio Club members received their TNC kits last week. Leo Toussaint, KC4DE, is building his .... Marathon builder, Bill Digby, NK4K, (inspired by NK6K I suppose) received his last Friday PM and telephoned me Saturday noon to ask for a comment on the sound of the burst and CW ID! A very commendable effort..... he has not been able to connect I think due to his poor antenna at his current townhome location. He expects to move into a single family residence within the next few weeks so look for more out of Bill."

"The best news I have saved for last. Prompted partly by WPB ARES decision and our own interests in digital modes of communications, the Dade Radio Club will be

putting up a TNC to serve as a repeater for the local area. The location is not firm as of this writing, but we have tentative permission to use a high downtown site. Hope to be able to link up with K4NTA-1 shortly."

I am sure that all you are as excited about that news about a Miami digipeater as I am. Good work Bill and the crew in Miami!

The following letter was written by FADCA member Dick Jansson, WD4FAB to Harold Price NK6K: ".... Current TNCs ; somewhat powerhogs....(the) power usage connotation is not intended to take away from the fine performance of these TNCs, but power requirements are a problem for AREC emergency powered communications."

"As an Official Emergency Station (OES) and active in the AREC operations of the ARRL North Florida Section, I have made it my concern to be capable of full operations while fully isolated from commerical power. Recently the NFL SCM, W4UEA, had defined a need for digital communications as a requisite component of AREC operations. I wrote him and strongly urged that Packet communications be used rather than any form of RTTY for these communications."

Dick sure has the right idea there! A packet radio network for emergency communications is a natural, speed and no errors. I have talked to Manny W4SS, the South Floirda SEC, about emergency communication using packet and he is in full support of it.

By the way Dick, WD4FAB is the Chairman of the ARRL VHF-UHF Advisory Committee. Watch the June issue of QST for a proposed 23CM band plan. There will be allocations for digital modes. Dick would like us to review these proposals and comment to the ARRL.

Howie, N2WX has really gone to town on the Xerox Big Board computer. He has worked out the state machine and software for a dedicated 1200 baud digipeater using the Xerox. We understand that Xerox has no more of these boards used with chips,but I think you can still buy the bare boards. If any of have the boards, check with Howie and he can tell you all about it. In fact read on and he describes his work. Next step will be the SOUTHNET network controller!

Has anyone out there done any work with the Advanced Micro Devices Am7910 "World Chip"? This chip has both a Bell 103 and Bell 202 as well as CCITT V.21 and V.23 modem all on one chip. It requires a 2.4576 Mhz crystal or clock and that is it! When I get finished putting together this month's FADCA>BEACON I plan to get one wired and compare it to the TAPR XR2211 demodulator, but if anyone has used one, I sure would like to hear from you.

The TAPR Kits are really rolling out of Tucson. They say that the backlog has been worked down and orders are turned around as soon as your check clears. If fact so many new people are coming on line, that I am making no effort to make a list and print it here.

In last month's FADCA>BEACON, I talked about the requirement of a digipeater to follow the FCC rules for repeaters and as a after thought I talked about how a station could be indentified in text rather than CW. I have come to realize that CW id's really slow down the throughput of a system and are not really required at all. It takes about much longer to send an CW id than the average lenght packet. Every time a CW id is sent, a packet can not get though, if there is a packet on the fly when a CW id comes on, the packet will require a retry. All of this really slows things down. Also the TAPR TNC's sends an id when they disconnect if the CWID is ON. So here is my suggestion, leave the CWID OFF and send a beacon every 9.5 minutes (BEACON EVERY 57) with a BEACON TEXT of "de K4NTA/R" the /R if you have your digipeater on (DIGI ON).

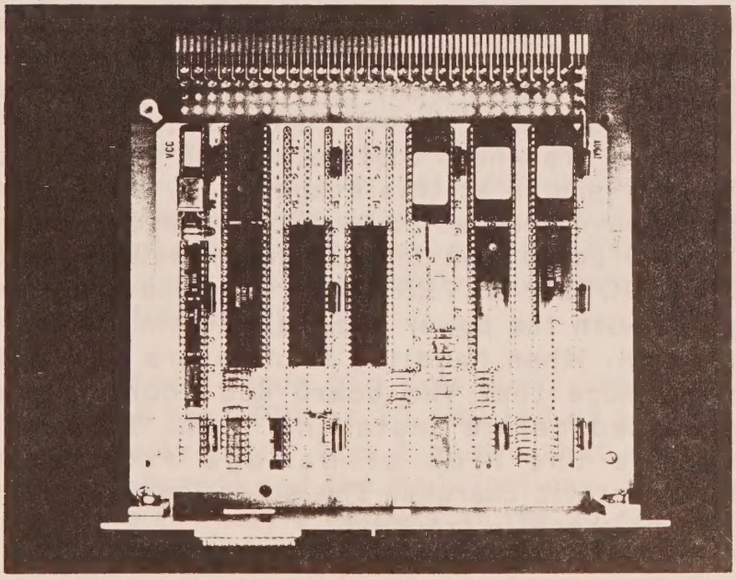
The TAPR TNC's have a command called DWAIT. I am sure that you all have read the manual and know what this on does, but just in case. The DWAIT is supposed to give a digipeater the first shot at the frequency over the regular local stations. This is done by causing a TNC to wait 40ms for every DWAIT (DWAIT 2 = 80ms), after it hears that there is no data on the frequency. In order to keep a system with good throughput, the digipeaters need to get the first shot. If you operate a digipeater with high antenna used by a bunch of people, set the DWAIT to 0 on the digipeater and all normal stations should be set to DWAIT 2. We will give this a try and see how it goes.

The two meter band was wide open for a few days in April. There were a lot of stations on and most were digipeating via K4NTA-1. All of this activity brought a few things to light. For one the CWID as mention above. Another was the need for network linking. Tom, K4GFG is working on a proposal, but why should he have all the fun. Let's all be thinking about now to do the linking between cities.

DO-IT-YOURSELF WIRE-WRAP TNC

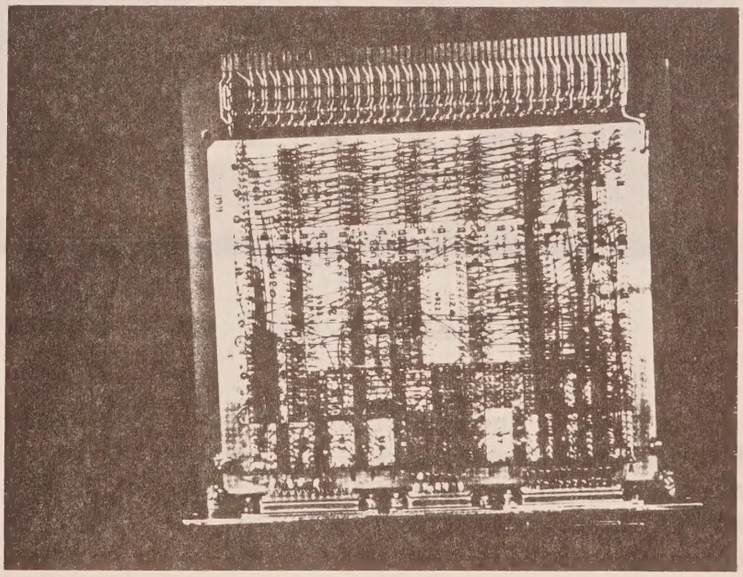
Bill Hite, K4RHD
9849 Commodore Dr., Seminole, FL 33542

Why on Earth would anyone want to build their own Packet TNC from scratch? Simple; back in December 1983 when we were introduced to packet, there was a 3 or 4 months back log of orders from the Tuscon TAPR group and we were ready to go then. Second, we thought maybe it could be done less expensively due to our large accumulation of surplus parts. Who is "WE", Jim, W4APV; Bill, K4IJL; and yours truly, decided to pool our resources and build three TNC's jointly. W4APV volunteered to be parts procurer and expeditor, K4IJY would build the enclosures and power supplies, K4RHD would do the board layout and wiring. This articls will speak mainly of my experiences with the board building process. Although the project was building a TNC, the gereral planning and build sequence can be applied to and any electronics project.



LOGIC BOARD

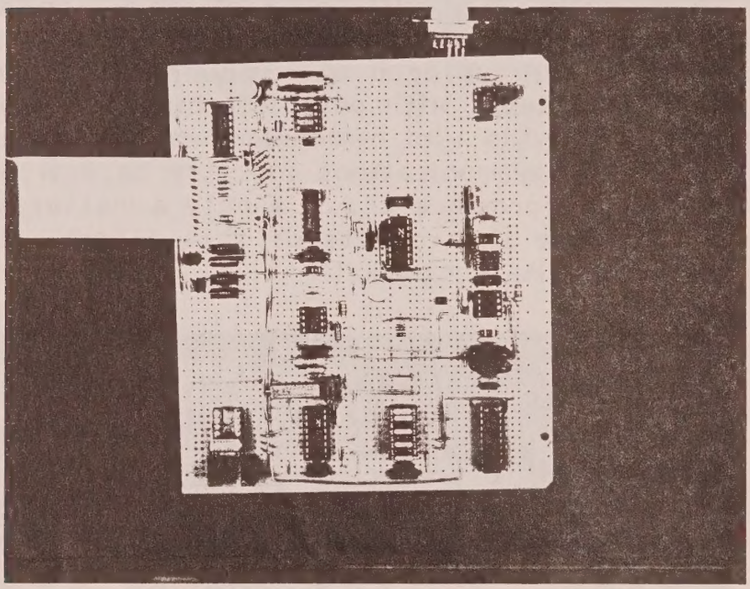
The first decision was to build the bulk of the digital logic circuits on one board using the standard wire and solder process. The modem board would be mounted above the wire wrap board on threaded stand-offs. This was mainly predicated by the fact that the wire wrap boards available would not accommodate all of the TAPR circuit. This restriction was for the best, because the modem board can be removed and replaced with modem boards of different design with out disturbing the logic board. (There is a lot of development being done in the telecommunications industry to improve modem performance and it's only a matter of time before the results of this effort will surface in amateur packet).



LOGIC BOARD

The next step was to place the parts on the boards in an arrangement that would result in the shortest, most direct wiring. This is very important in both digital and analog design, especially when both are interconnected in the same system. The digital circuits radiate less switching noise and the analog circuits pick up less noise. The more time spent on parts layout in the beginning will pay big dividends in over all system perforance later. Trying to cure the ills of a poorly arranged circuit, after the fact, can be a nightmare. The best method that I have found for laying out a board is to cut from

heavy paper, cardboard, or mylar (I perfer mylar) a silhouette of the larger parts (integrated circuits, transistors, pots, etc.) and lay these pieces on the board or paper copy of the board. Try to visualize, using the schematic, where the build of the wire will run. After a few trial and errors you will find a parts arrangement which will yield the shortest wire routing. Remember, time spent here will usually be rewarded later in a functional circuit.



MODEM BOARD

Actual construction can now begin but first a word about sockets and connectors. From experience I have found the weakest link in any electronic assembly is the mechanical interconnections, especially here in Florida with our high moisture levels. I try to avoid using sockets for transistors and IC's except in temporary bread board applications. However, where very large and expensive parts are employed, sockets are required in order to facilitate trouble shooting when a problem arises. So, when required, purchase the best sockets and connectors that you can afford. These will usually be gold plated contacts and some times will cost several times the price of the parts plugged into the socket. Malfunctions contributed to mechanical contacts usually do not surface until much later, perhaps as long as several years. Oxidation is the culprit and is accelerated by heat and moisture. Enough on that subject!

After all parts are securely mounted (excluding the transistors and IC's) the wiring can begin. Remember all the effort to lay out the parts for shortest wire runs? Measure and cut each wire for the shortest, most direct route. Before you begin the wiring, you might wish to consider a neat product on the market to reduce the wiring time and also eliminate many wiring errors and well worth their price. The product is called "SOCKET-WRAP I.D." produced in Sweden and available from Jameco or Digi-Key mail order. They are plastic lables that fit over the wire wrap sockets and identify each pin by number used on the schematic.

Upon completion of the wiring, carefully inspect the board for loose scraps of wire or other forms of contamination, broken or unconnected wires. Next perform a continuity check of the whole board. If possible, make a copy of the schematic both for checking off the installed wiring with one color and continuity checking with another color pencil. Be particularly careful that all power and grounds are wired correctly because an error there can cause serious and expensive damage when power is applied

Check out the power supplies before connection them to your circuit board. Using an accurate meter, verify that all voltares are within +/- 5 percent of nominal values. With all plug-in transistors and IC's still removed from the board, apply power. Check that all supply voltages are where they belong and there is no heat or smoke at this stage. Many expensive parts have been saved by this procedure alone. Remove power and install the transistors and IC's (NOTE - NEVER insert or remove active parts with the power applied). Another note of caution. When handling transistors and IC's make sure that the board and yourself are grounded before installing them. This will reduce the risk of damage from high electrostatic charges. The soldering iron must also be properly grounded.

With all parts installed, reapply power. Feel all parts for excessive heating and look for smoke. Remove power immediately should that occur. If all parts are functional the chances are good your circuit will work the first time. My digital board worked the first time but I was not so blessed with the modem board. First, I by-passed a complete continuity check and did only the power and grounds (shame on me). After correction the wiring errors I found

a defective XR2206 modulator IC. I have been happily packeteering ever since.

Just a closing note on a circuit change. The crystal oscillator was redesigned because it was found to be marginally unstable. Sometimes it would fail to start or would oscillate at the third overtone. After some research and bread boarding I came up with the circuit shown in the NYBLES and BITS article. I understand others have experienced simular problems, so maybe this circuit built on the wire wrap area of the kit boards will do the trick. Happy wire wraping. I'm off to start wrapping TNC #2 and #3.

TRANSMITTER DEVIATION ADJUSTMENT

Tom Kneisel, K4GFG
1600 SW 115th Ave., Davie, Fl 33325

The equipment used for these tests was a kit version TAPR TNC with its standard SCF (switched capacitor filter) values plus the modifications recommended in the February FADCA Beacon for improved S/N performance. The modulation output of the buffer following the EXAR 2206 chip was fed to an emitter follower and then to an Hp8656 signal generator. This yields a flat transmit audio response, which as I mentioned in my article in last month's BEACON appears to be the correct transmitter response that the TAPR board plus most "normal" receivers want to see. The receiver used was again the Motorola handheld MX350 radio. The speaker output was fed back into the TAPR board, and the volume control adjusted to present about .2 volts peak at the input to the EXAR 2211 with 3 Khz deviation at the signal generator. Tone balance from 1200 Hz to 2200 Hz at the input of the chip was about 1 dB. To measure PPR (packet probability of reception) the TNC was placed in the full duplex mode and 100 packets, each consisting of one text character, were sent in the CONVERS mode and displayed on the screen with MON "ON". PPR is simply the fraction that get through successfully.

Steve Goode had previously reported in QEX #18 that PPR at 20 dBQ (dB of quieting) was nearly zero. Fig. 1 shows that with the new kit boards and the modifications, it is now possible to receive packets at the 20 dBQ level (-113 dBm) with a PPR of .6 or so. Four curves of PPR vs RF signal level are shown, each for a different transmitter deviation. Notice that both low and high transmitter deviations will degrade packet performance. At 2 Khz deviation, the audio S/N ratio out of the receiver begins to fall due to the fact that lower deviation means lower recovered audio competing with the recovered noise. The PPR degradation for high deviation is somewhat more difficult to explain. Note that the dB's on the graph are quite expanded, and that the degradation of the PPR occurs within just a few dB. This is due in part to the threshold effect of FM communications where "clicks" and other noise come up rapidly as the RF carrier is lowered past a certain point. Higher levels of transmitter deviation raise this threshold, so that if the RF level is held constant, increasing the deviation has a similar effect to lowering the RF level, and the S/N ratio of the recovered audio will actually become worse.

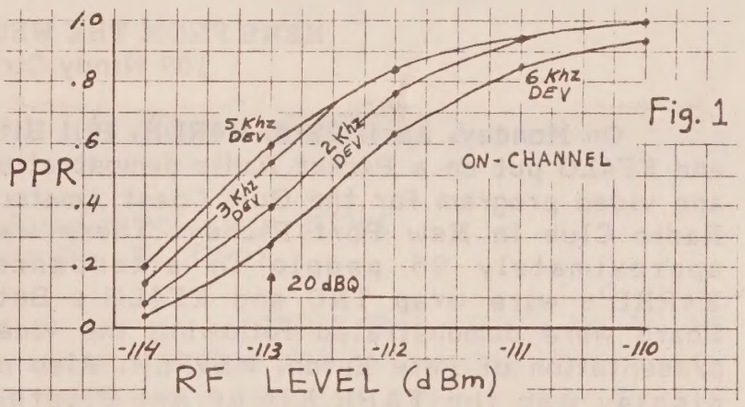


Fig. 1

Fig. 2 shows the effect of RF carrier offset upon PPR at a signal level just a few dB above 20 dBQ. The importance of netting both the transmitter and the receiver to the desired frequency can be seen. With 5 Khz deviation, a 2 Khz frequency error can degrade near perfect copy to perhaps 50% copy. The 3 Khz deviation curve appears somewhat more forgiving.

Fig. 3 shows the effect even more dramatically. When the RF carrier is on frequency the PPR is seen to peak at .92 with about 4 Khz of transmitter deviation and this peak is rather broad. When a frequency error of +2 Khz occurs however, the PPR degrades considerably for transmitter deviations above 2

Khz, falling to .03 at 5 Khz. The MX350 radio has pretty good modulation acceptance but I'm sure this curve will vary considerably with other radios, many being degraded even worse.

I recommend that we use 3 Khz transmitter deviation for packet operations. Its performance is not far from optimum when receiver signals are on-channel and it maintains PPR performance better than higher deviations when stations are not precisely netted on frequency. The lower deviation should also narrow our transmit sideband spectrum making our packet operations better neighbors to other amateurs on adjacent channels.

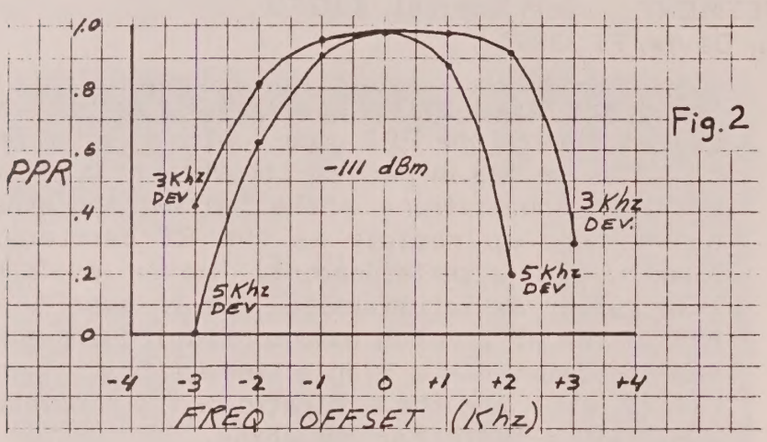


Fig. 2

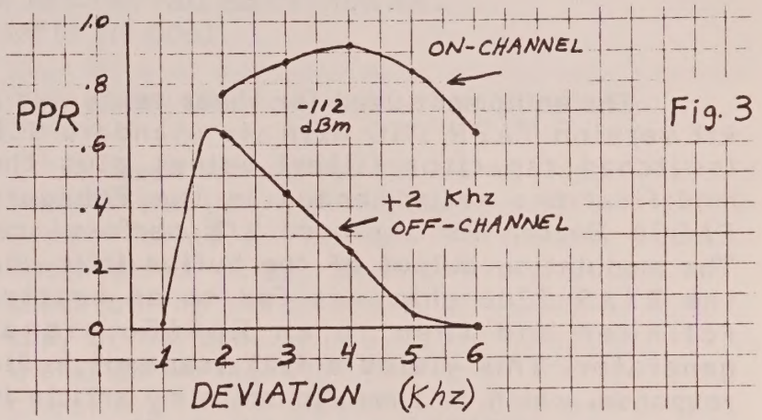


Fig. 3

NEWS FROM THE WEST COAST Bill Sams, KF4LG
109 Windy Circle, Brandon, FL 33511

On Monday, April 23rd, K4RDH, Bill Hite and KF4LG put on a Packet Radio demostration and video program for the Gulf Coast Amateur Radio Club in New Port Richey. There was approximately 85 people in attendance. K4RHD's wire wrap TNC and KF4LG's Beta Board were demonstrated following the video presentation of Pete Eaton, WB9FLW. Also on display was the TAPR Kit of Art Pfister, N4NFL - Quite a comparison.

The West Coast activity has been down some. Pat, KF4EF has been in South Carolina, Jim, W4ORA is traveling again and KF4LG has been tied up at work. KK4S, WD4IXI and R4RHD have been up and beaconing fairly regularly. Brad, WB8ZPE have been tring to get his kit up, but has had a lot of problems with a bad CPU chip and trouble in the oscilator section. We hope to have him going soon though. Bill, K4RHD is wire wrapping two more boards for his group in ST. Pete.

The two meter net on 147.165 +600 on Sunday night at 7:30 PM is fairly well attended and has KF4EF as net control. Some of you East Coast fellows could probaly make it in. We'd like to have you.

The Avon Park picnic sounds great. It will be a good opportunity to eyeball these faces behind the keyboard that we have enjoyed talking to. Unfortunataly, KF4LG will be in Baltimore on a college initation trip with my junior op on that date. We will be with you in spirit though and i fell sure the West Coast will be well represented.

NYBLES and BITS Bill Hite, K4RDH
9849 Commodore Dr., Seminole, FL 33542

I would like to suggest that the above title become a monthly article which would be composed of short technical notes send in by us, the readers. It would become to the FADCA>BEACON what HINTS and KINKS is now to ARRL's QST. Anyway, I'll start the ball bouncing with the following notes. (Sounds like a great idea Bill has here. If the readers send it in, we will put it here.... Editor)

TNC CRYSTAL OSCILLATOR. Several persons have had trouble with the TAPR TNC (Kit) oscillator circuit. Sure enough, a bread board model exhibited instability ranging from third overtone oscillations to no oscillations at all. The following redesigned circuit shown in Fig. 1 has proven stable with three different 7.3728 Mhz. crystals as well as with other crystals of different frequencies. Also with other 74LS04 chips. Some experimentation with C1 may be necessary for some crystals, but generally, use the lowest value of capacitance that maintains stable oscillation. This type of oscillator circuit is not recommended for precise frequency control, but is adequate for most CPU applications where accuracy is ot required.

TNC POWER-ON RESET. Another problem I have experienced with the TAPR TNC is that the CPU does not always reset during power on sequence. This is not a serious problem if you are present to initiate a manual reset with switch S3. In applications where the TNC will be operated as a digipeater with no one in attendance, a reliable reset is an absolute must with Florida's frequent power interruptions. The curcuit of Fig 2. has been used for several years on two different CPU boards using 6809 processor chips and has never failed to perform a power-on reset even on short interval power down-up cycles.

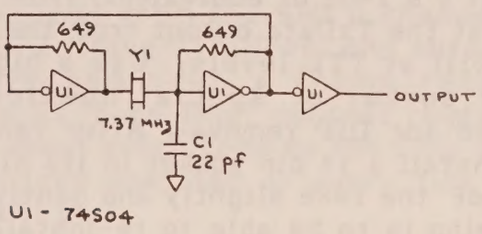


FIGURE 1

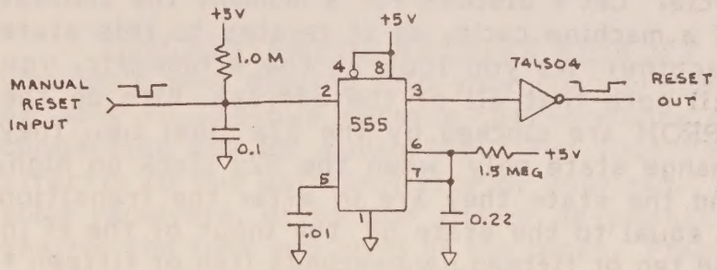


FIGURE 2

THE HOMEBREWED FRAME by Howard Goldstein, N2WX
1707 S. W. Cardinal St., Palm Bay, FL 32907

Xerox 820 "Big Board"

"IMPORTANT: Do NOT attempt to perform any modification of your equipment unless you are competent in the technology. Instead, find someone in your area who can do the work for you. Neither the publishers of the FADCA>BEACON, FADCA, nor myself take any responsibility for anything that may occur directly or indirectly as a result of following the suggestions in this article"

Last month's "Homebrewed Frame" had kind words for the surplus Xerox 820 boards. These $53 wonders ran out in the afternoon of April 17. I did manage to get a pair before then, and I put them aside while awaiting some Z-8530s (the two channel SDLC controllers) to build onto the 820 in a piggybacked arrangement. As I write this the 8530's are known to be enroute but have not arrived. (8530's arrived May 3!) In spite of this the 820 is on the air as N2WX/R-7, thanks to the FB message that Ted K4NTA got from Pete Eaton. He received a message from Sumner Hansen WB6YMH on some hardware to help the Xerox 820 onto packet. I am indebted to Mr. Hansen, whose design I present in figure 1, for the circuitry of a state machine decoder and NRZ to NRZI converter. I added to it slightly in order to generate to the right clock phase for the transmit flip flop I used.

The N2WX board was built using wire wrap techniques and takes up about 4" x 2" on perfboard with some open space between the sockets. Six wirewrap "component" posts have soldered to them the leads from the ribbon cable that connect the boards.

The circuit U1a and b latch the received data on the positive going edge of the 32x clock. Note that the output of U1a is tied to the input of U1b; this causes the output of U1b

to reflect the previous output state of U1a. This is how the circuit determines whether a transition has occurred - if U1a<>U1b then a transition has occurred. Transitions are important to us because the NRZI modulation scheme says that: If a transition has taken place, decode a 0. If no transition takes place, decode a 1. Incidentally, it is because of the NRZI method that the same exact frame sometimes sounds different during retries - the tone isn't important - it's the change between either tone that counts.

Address inputs to the state machine EPROM (U3) are the two flip-flop outputs and the lowest six ("least significant") data bits that the EPROM output in its previous machine cycle. Let's discuss for a moment the concept of a machine cycle, as it relates to this state machine. As you look at the schematic, you will note that all of the address bits on the EPROM are clocked by the 32x line; i.e., they change state only when the 32x clock go high, and the state they are in after the transition is equal to the state of the input of the ff in the ten or fifteen nanoseconds (ten or fifteen * 10^-9 seconds) prior to the transition. This is called negative hold time. Each time the 32x clock goes from low to high marks the beginning of a machine cycle. Without this the clocking - or latching - of the lines, the machine would literally run crazy, because the address inputs would be changing state at the same time as the data outputs. This is because the outputs from this cycle in part form the address inputs for the next cycle. If they were allowed to change at will - that is, asynchronously, the operation of the machine would be unpredictable and useless for our purposes.

The 'program' burned into the state machine EPROM controls the cycles by combinations of outputs that extract a data clock and the NRZ data from incoming NRZI. (see fig. 2)

U4a handles the conversion from the transmitted NRZ from the SIO to NRZI for the modem. NRZ is inverted before being fed to into the JK FF because the output of the FF toggles only when a logic 1 is presented to both inputs, but we require a toggle on a transmitted state of 0. Because both the 74LS76 and the SIO clock on the falling edge of the data clock it must be inverted, since the SIO changes its TxData output state on the falling edge and an inverted clock to the 74LS76 lets the FF work on that line after it changes state and has had time to settle. If we do not use the inverter than an extra transition might occur because there are sometimes 3 rising edges for each data bit, but always only 2 falling edges.

HOOKUP DETAILS. All of the receive circuitry can be hooked up without modifying the board. Unfortunately this is not the case for the transmit side. Obtain at least an 8 lead length of ribbon cable. Two of the leads will supply +5 and ground to the piggybacked board. Locate a spot near J9 to get +5 and ground and hook up those leads.

TRANSMIT. You must carefully remove U111 (it's a 1488 or equivalent) from the Xerox to get at the TxData output from the SIO while it is still at TTL levels. Use a high quality solder sucker or special desoldering tip designed for DIP removal. After removing the chip, install a 14 pin socket in its place. Bend pin 13 of the 1488 slightly and gently, the idea here being is to be able to re-install the chip, while leaving the pin sticking out. After you have put the chip back in the newly installed socket, connect one of the ribbon cable leads to the free pin, and the other end of the lead to U4 pin 15, NRZI DATA, on the state machine board. On the solder side of the Xerox board, connect another ribbon lead to the pad where pin 13 of the U111 socket is. The other end of this lead goes to NRZ DATA, pin 1&2 of U5.

RECEIVE. Connect a ribbon cable lead to pin 38 of J9. If you don't have the right clips and must solder, to save the jack make your connection on the back of the Xerox board, not to the pins of the connector itself. The other end of the pin 38 lead goes to U1 pin 2 as NRZI data.. Hook up another ribbon lead to J9 pin 36. This is the 32x CLOCK and goes to U1 pin 3.. Another ribbon lead goes to J9 pin 9 or 11 and then to RECOVERED DATA on the state machine board.. The final connection with the ribbon cable is to J9 pin 31 or 37, the other end to RECOVERED CLOCK.

JUMPERS. Remove any jumpers between J9 11-12,9-10,32-31,35-36. INSTALL a jumper between J9 33 and 35. This connects the SIO's RxCa with TxCa (clock).

EPROM. The EPROM implements the

program for the state machine. A short C program is used to generate this program. A dump of the EPROM (in INTEL hex format) is reproduced in figures 2.

SOFTWARE. The software I wrote handles the AX.25 level 2 protocol, and supports full duplex operation. The code is written in Z-80 assembler and is interrupt driven. Receive interrupt service time is a good indication of the maximum speed the board can handle. In this non-optimized version, the servicing routine takes around 173us on all but the first and last characters of a frame. I think it should be capable of not more than about 44K baud (see computation 1), although the actual limit has not been verified.

Briefly, the software stores correctly received frames from the SIO A channel in a logical FIFO ("ring") buffer, and sets a flag that there has been a frame received. Interrupts to "time line" control routine are generated about every 26ms by the CTC, and one of the routines executed on every tick of the CTC is a test for:

```
(full_dup ? rcvd_flag_a : (rcvd_flag_a && !cdtect()) )
```

This line describes a condition that starts the repeater check (expressed in the C language). In English: if we are running full duplex then execute the repeater code if the rcvd_flag_a (frame correctly received flag) is true. If half duplex, execute the repeater code if there is no carrier on frequency and the rcvd_flag_a is true. This check for half duplex and the holdoff require that incoming frames be buffered, and in the current version I have allocated 16 receive buffers (and 16 transmit buffers) for this. Each buffer is associated with a four byte control block that contains a pointer to the beginning of the buffer, and a count of the size of the frame in the buffer. The advantage of using a separate table of pointer and length arguments is that it eliminates the need to physically move a frame (which takes up a lot of processor time), and to some extent may reduce the amount of code we'll need when the other channel is brought on line for a gateway. In operation, when a frame needs to be repeated by the Big Board the pointer to the receive buffer swapped with the pointer to the next open transmit buffer and the frame is sent at the next opportunity. It's much faster to swap four bytes than 328!

It's fair to question why we bother having seperate buffers at all. The reason is that it implements full duplex cleanly, and it makes all this code usable with little or no change by the level 3B and 4 that Florida's hams eventually adopt, because the problem of arbitration between the allocation of free buffers between received buffers and outgoing buffers is not needed.

BB STATUS. There is no system watchdog (yet), so if the power glitches and the power on clear circuit on the BB doesn't respond with a reset, down she goes. However, a transmitter watchdog is implemented separately on the Vancouver VADCG modem.

DISCRIMINATOR RECEIVE PICKOFF If you don't mind digging into your rig you might be able to improve receive performance by connecting the Rx Audio Input for your TNC directly to the discriminator of your rig. In some receivers, distortion and/or de-emphasis destroy the tone and level of the tones. Please see the article by Tom K4GFG in the April BEACON for a complete discussion of the requirements of modems using the XR-2211 (like TAPR and VADCG). (Note to TAPR TNC users: you will most likely need to change the switched capacitor filter's header for a flat response. Do this because picking off the discriminator bypasses the de-emphasis of your receiver and the normal configuration of the filter on TAPR's TNC pre-emphasises the Rx audio input to achieve tonal balance)[contact K4GFG for more info]. After doing this with a Kenwood TR-7930 (easy pickoff in here) an immediate (but non-quantified) improvement was observed in the reception of weak and noisy frames. Yes I know everyone has a great receiver, but may be fine on phone might very well be unusable on packet by anyone except locals and during band openings. I recommend to those wishing the best performance from their demodulators to give this approach a try - you may be surprised by the results. Another payoff from this mod: your normal volume and squelch controls function once again, and you can listen to the activity on the channel. (Do any of you also listen to the packets when you're on the air?)

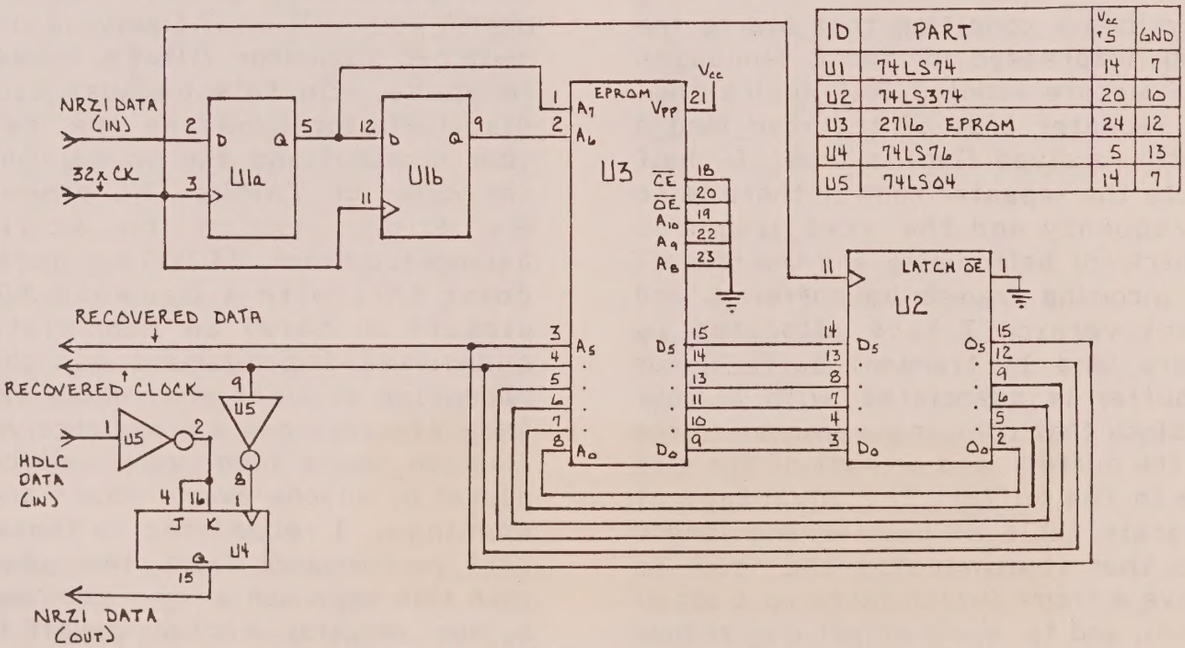
HE'S NOT HEAVY, HE'S MY UNCLE When inter-digipeater links are finally established

here in Florida, in some cases directional antennas and moderate (100w) power will be required. Depending on the antenna HATT (height above average terrain), the extensive logging demands exerted by 97.103 come into effect and this has discouraged some from implementing digipeaters, and I'm sure will continue to discourage others who won't or can't comply with the requirements. Why should packeteers have to foot the bill for the ineffeciency of voice and other wasteful modes that exist on most repeaters? We use time division of the channel and this is spectrally conservative, especially compared to most of the other modes in use. Maybe now is the time to petition FCC for rulemaking to eliminate this logging requirement for stations using packet and other efficient techniques. One different approach might be to allow increased power to those <u>using</u> directional antennae as this in itself allows more sharing. The time is ripe for petitions of a deregulatory nature that also enhance our capabilities. It certainly would increase the exchange of information amongst us, thereby improving our ability to further the state of the art.

<u>NEXT MONTH</u> The Am7910 World-Chip modem and the BB. A system watchdog for the BB. Level 3A software for the S-100 Z-8030 TNC described. And whatever else happens to get latched in the residue bits.

(The author can provide OASIS 8" diskettes with the source code for the Xerox BB digipeater and C source for the program to generate the state machine EPROM. Source listings also available. The author will burn your 2716's with the digipeater software and callsign or state machine program, if that is what you want. You must send a blank floppy and/or EPROM(s) depending on what you want. Include $10 to help cover my expenses (wirewrap sockets in Melbourne are very expensive!, for any or all three - that is, $10 per shipment covers all - and send it to: H. Goldstein, 1707 SW Cardinal St, Palm Bay FL 32907, (305) 724-1826.)

FIG. 1



ID	PART	Vcc +5	GND
U1	74LS74	14	7
U2	74LS374	20	10
U3	2716 EPROM	24	12
U4	74LS76	5	13
U5	74LS04	14	7

NRZ ⟷ NRZI CONVERTER (WBGYMH)

F O R S A L E

FADCA has received, through a donation, a limited number of Zentec Zephyr/Zms-35 smart video terminals. These terminals were removed from service when the company making the donation changed to an IBM-36 computer system. They are 24 lines of 80 characters each. I/O is via a RS-232C port at 110 to 19200 baud. The Zephyr keyboard has 103 keys in four groups: a typewriter block, including extra keys to control the terminal and the CRT cursor; a separate nurmeric block; a block for cursor control, text editing, and data transmission; and a row of program function keys. It operates full or half duplex, odd, even, or no parity and 7 or 8 data bits by proper setting of a dip switch in the rear of the terminal. FADCA is selling these terminals as is for $125.00. One half of the proceeds must be paid back to the company who made the donation, guess you would call it a half donation. These look like pretty good termimals, K4NTA is using one when his TRS-80 is tied up and it works fine. We will have these terminals at the picnic in Avon Park, but if you want one, let Ted Huf, K4NTA know right away. A $25.00 deposit will be required to hold one until the picnic. Remember half of the price of these termimals go to FADCA, so support your club and buy one.

Computation 1 N2WX/Systek Big Board Digipeater 6 May 84

$$Pt(min) = (t(st) + [n-2]t(char) + t(end)) \times T(proc)$$

$$S(max) = \frac{1}{\frac{\langle Pt(min) \rangle}{\langle n \rangle}} \times 8$$

Where: n = Smallest allowed # of octets allowed in a frame
Pt(min) = Minimum time in seconds to receive the smallest valid frame
S(max) = Maximum sustainable baud rate
t(st) = T states to process character C(0)
t(char) = T states to service the x'th character where 0 < x < n-1
t(end) = T states to process character C(n)
T(proc) = Processor clock interval
C(0..n) = The contents of a frame

Pt(min) = 2.71ms = (840 + [13] * 434 + 292) * 400ns

S(max) ~= 44,200 baud = [1 / (2.71ms / 15)] * 8

```
:10000000010203040506070B090A0B0C0D0E0F1068
:10001000111213141516171B191A1B1C1D1E1F0078
:10002000212223242526272B28292A2B2C2D2E2F3048
:10003000113233343536373B393A3B3C3D3E3F2078
:10004000202122232425262728292A2B2C2D2E40
:10005000333435363738393A3A3B3C3D3E3F202140
:10006000202122232425262728292A2B2C2D2E20
:10007000333435363738393A3A3B3C3D3E3F202120
:10008000202122232425262728292A2B2C2D2E00
:10009000333435363738393A3A3B3C3D3E3F202100
:1000A000202122232425262728292A2B2C2D2EE0
:1000B000333435363738393A3A3B3C3D3E3F2021E0
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:1000F000113233343536373B393A3B3C3D3E3F20BB
:0000000000
```

FLORIDA AMATEUR DIGITAL COMMUNICATIONS ASSOCIATION MEMBERSHIP REQUEST

NAME.....CALLSIGN.....

LICENSE CLASS..... TAPR MEMBER? Y/N OTHER MEMBER?.....

ADDRESS.....

CITY.....STATE.....ZIP.....

PHONE (H) (.....)..... (W) (.....).....

FREQUENCY HERE I CAN BE FOUND:.....

I OPERATE: RTTY? Y/N AMTOR? Y/N OTHER.....

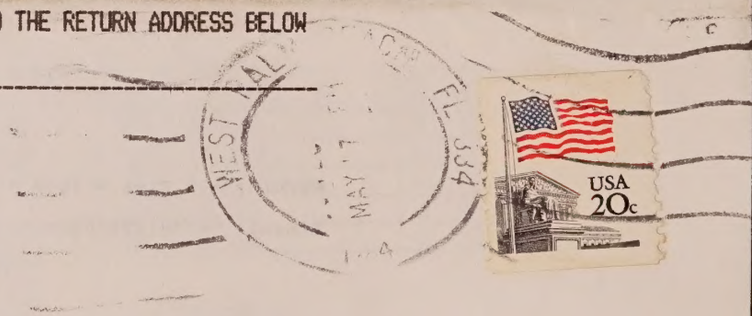
TYPE COMPUTER EQUIPMENT:.....

PACKET GEAR OWNED OR ON ORDERED? Y/N TYPE:.....

SUGGESTIONS, PROPOSALS, COMMENTS, NAMES OF OTHER INTERESTED PERSONS.....

.....

MAIL THIS FORM AND YOUR MEMBERSHIP DUES OF $10 TO THE RETURN ADDRESS BELOW



FLORIDA AMATEUR DIGITAL COMMUNICATIONS ASSO
c/o Ted Huf, K4NTA
1829 N. W. Pinetree Way
Stuart, Fl 33494

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